



Office of the
Inspector General
Commonwealth of Massachusetts

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Inspector General

**A Big Dig Cost Recovery
Referral:**

Contract Mismanagement by Bechtel/Parsons
Brinckerhoff May Have Increased Big Dig Costs

December 2003

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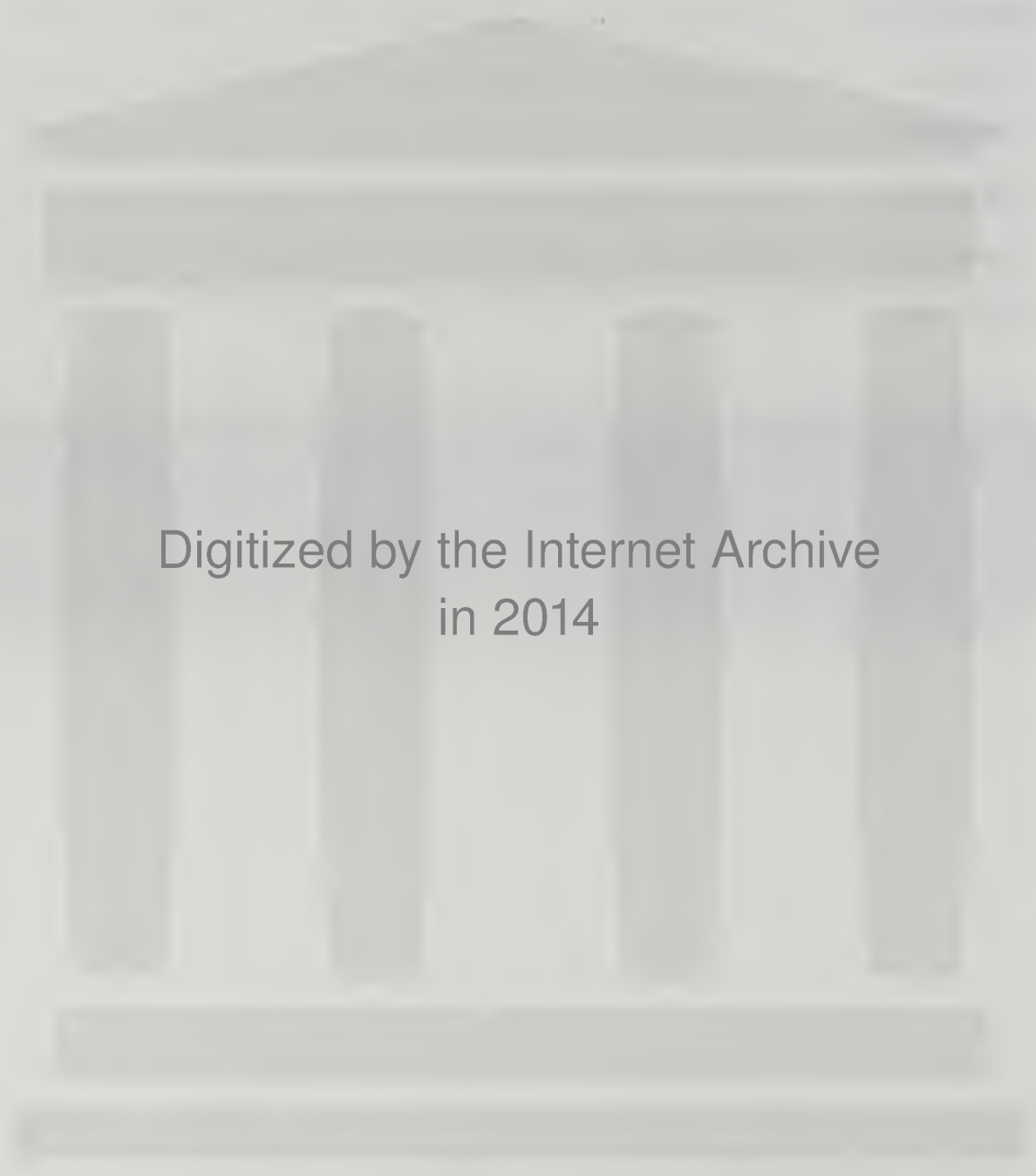
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Executive Summary

Since the mid-1990's, the Office of the Inspector General (OIG) has been investigating the cost recovery efforts of the Central Artery/Tunnel (CA/T) Project. "Cost recovery" is the process by which "public and private owners file claims against design and construction management professionals for the costs claimed to be attributable to errors, omissions, or other "deficient" or unsatisfactory performance issues ("cost recovery claims").¹ This report is the latest in a series of cost recovery related reports that the OIG has released since 1998.²

This report constitutes a referral of potential cost recovery issues to the Massachusetts Turnpike Authority (MTA). These cost recovery issues stem from the failure of the CA/T Project's management consultant, Bechtel/Parsons Brinckerhoff (B/PB), to take certain prudent steps recommended by the OIG to prevent cost increases.

The OIG made these recommendations in a series of 13 legislatively mandated reviews of CA/T Project construction contract and design packages. The OIG completed these 13 mandated construction contract reviews³ between 1994 and 2003⁴ before construction began on these 13 contracts. The OIG recommendations pertained to eliminating potential causes of cost increases during construction.

The OIG found that the 13 construction contracts have increased by \$125 million through the issuance of more than 1,600 change orders. The reviews issued by the OIG cautioned the CA/T Project regarding, among other things, contract cost growth from design changes, contractor access restraints, and the need for strong cost

¹ David J. Hatem, "Errors/Omissions Cost Recovery Claims against Design and Construction Management Professionals." The CA/T Professional Liability Reporter 1.4 (1996): 1.

² See Appendix A for a list of cost recovery related reports.

³ Statutorily Mandated Reviews of Central Artery/Tunnel Project Building Construction contracts 1997-1999, December 1999, Statutorily mandated Reviews of Central Artery/Tunnel Project Building Construction contracts: 1994-1996, December 1996.

⁴ See Table One for a listing of the 13 contracts.

containment measures. In a number of cases, B/PB failed to use the OIG's recommendations.

For example, the OIG warned that access restraints for construction contractors could create delay claims that would increase CA/T Project costs. A review of these contracts identified \$8.7 million in access delay related cost increases. Through a sample of the change orders that created the \$125 million worth of construction contract cost increases, the OIG identified more than \$24.8 million in cost increases (nearly 20 percent of the total \$125 million increase) that relate directly to specific issues raised by the OIG in previous reviews or reports.

The OIG also identified \$3.5 million in design contract cost increases during construction. This brings the total cost increase for the contracts the OIG reviewed to almost \$130 million. Various cost recovery issues that need to be pursued by the MTA will be discussed. For this report, the OIG revisited these 13 contracts to determine if:

- 1) the cost of these contracts increased significantly during construction;
- 2) these cost increases could be attributed to the unheeded warnings issued by the OIG in the 13 mandated reviews; and
- 3) potential cost recovery issues could be referred to the MTA.

As a result of the review of the 13 legislatively mandated CA/T Project contracts, the OIG believes that it is evident that B/PB mismanaged contracts and contract costs. Contract costs increased during construction because B/PB failed to heed warnings issued by the OIG in previous reviews. The MTA should hold B/PB responsible for these cost increases and cost recovery should be pursued against B/PB.

Introduction

Since 1994, the OIG has completed 13 CA/T Project reviews mandated by the Massachusetts General Court.⁵ The most recent mandate, Section 56 of Chapter 235 of the Acts of 2000, states in pertinent part:

[the Massachusetts Highway Department] shall . . . construct, control, supervise or contract such structures; provided, however, **that no such construction or contractual agreement shall begin prior to the review and approval of the inspector general.** [Emphasis added.]

In 1996, the legislature mandated that before the award, the OIG review *and* approve CA/T Project contracts. The 13 mandated reviews conducted by the OIG had an original construction value of more than \$310 million. In these reviews, the OIG commented on a range of issues including:

- scope transfers
- contractor access restraints
- facility life-cycle costs
- unexplained cost increases
- cost containment efforts
- excessive design changes
- compliance with M.G.L.
c. 149 bid law requirements
- third party mitigation leading to
design changes

Before approving these contracts, the OIG sought to verify that the CA/T Project had made a reasonable effort to ensure the completeness of the construction contract package (drawings and specifications) before the CA/T Project put the contract out for bid. The OIG also sought to verify that the CA/T Project had made a reasonable effort to identify and control or reduce contract costs. Under statutory mandate the OIG has revisited the contracts and reviewed the cost growth and explored explanations for this growth. As of December 2003, **the combined cost of the 13 contracts had increased by more than \$125 million -- nearly 40 percent.**

⁵ The OIG has conducted reviews pursuant to Section 11 of Chapter 102 of the Acts of 1994, Section 115 of Chapter 273 of the Acts of 1994, Section 667 of Chapter 205 of the Acts of 1996 and, Section 56 of Chapter 235 of the Acts of 2000.

Table One: Contracts Reviewed by the OIG between 1994 and 2003
(in order of date of award)

Contract (1)	Original Value	Value as of September 2003	Percent Growth	Date of Award	Status	Number of Change Orders
C24A2	\$7,573,000	\$8,401,934	10.95%	9/27/94	Completed (2)	64
C24F1	\$547,500	\$565,293	3.25%	11/18/94	Completed	3
C07A5	\$6,737,000	\$7,959,162	18.14%	11/23/94	Completed	52
C15A3	\$106,972,972	\$158,954,972	48.59%	7/17/95	Active	400
C24A1 (3)	\$750,000	\$800,000	6.67%	1/4/94	Completed	1
C07A1 (4)	\$639,344	\$657,833	2.89%	12/27/95	Completed	1
C17A3	\$72,430,000	\$112,504,604	55.33%	7/11/96	Active	215
C01B1	\$31,097,700	\$39,427,889	26.79%	4/14/99	Active	166
C09A3	\$31,249,006	\$38,847,693	24.32%	7/26/99	Active	238
C19E4	\$15,677,000	\$18,608,766	18.70%	10/27/99	Active	174
C07C1	\$7,344,000	\$18,120,617	146.74%	11/12/99	Active	168
C18A2	\$12,308,120	\$13,520,205	9.85%	5/14/01	Active	95
C19B9	\$16,944,000	\$16,952,357	0.05%	8/21/02	Active	31
TOTALS	\$310,269,642	\$435,321,325	40.30%			1608
COST CHANGE		\$125,051,683				

Source: Chart prepared by OIG staff based on CA/T Project data published in November 2003.

Table Notes:

- 1) See Appendix B for a description of each contract.
- 2) Completed contracts may still have open change orders or contractor claims that, once resolved, may increase the value of the contract.
- 3) The review of C24A1 encompassed only one change order (#10) to an already active contract. The change order in question dealt with the construction of a temporary police/emergency response facility. The OIG opined that this change order should be reviewed under the mandate. Subsequently, the CA/T Project issued other change orders related to the original change order.
- 4) The review of C07A1 encompassed only one change order (#198) to an already active contract. The C07A1 contract started before the OIG mandate. The change order in question dealt with the construction of a temporary toll plaza and an electrical substation. The OIG opined that this change order should be reviewed under the mandate. Subsequently, the CA/T Project issued other change orders related to the original change order.

Findings

Finding 1. Total construction costs for the 13 contracts reviewed by the OIG increased by nearly \$125 million, or 40 percent.

The OIG has continually expressed concern to the CA/T Project regarding contract cost growth during construction. The OIG informed the CA/T Project on many occasions that work paid for through change orders is invariably more expensive than work paid for after a competitive procurement process. Under its contract with the Commonwealth, B/PB is responsible for design and contract management including the review and negotiation of change orders. The more than \$125 million identified by the OIG to date, could have been greatly reduced if B/PB had accepted the OIG's advice and made the necessary changes in the original construction contract bid package. These contract changes might have avoided change orders that led to the large cost increases. Advice to the CA/T Project included more aggressive cost control measures such as value engineering and claims avoidance reviews.

The OIG understands that construction contracts may be subject to cost increases from a variety of factors including differing site conditions. However, it is the opinion of the OIG that in the case of these 13 contracts, some cost increases could have been avoided. A review of the change orders for the 13 OIG reviewed contracts identified a sample of change orders that may have been avoided if B/PB heeded the OIG's advice.⁶ Some examples are as follows:

a) In the April 1999 review of the C01B1 contract, the OIG stated:

According to CA/T Project staff, the C01B1 construction contract is dependent upon work to be completed under other construction contracts. If the preparatory work is not completed, then this contract may be delayed. The OIG recommends that the CA/T Project ensure that the C01B1 contractor is not issued a Notice to Proceed (NTP) until the construction site is accessible. After the NTP is issued, the Project must make every effort to ensure that the C01B1 contractor is not impeded by other contractors or site access issues. This will prevent costly delay claims and reduce the risk of change orders caused by

⁶ Reference Table Two for a sample of cost increases identified by the OIG.

additional mobilization and other delay related costs incurred by the contractor.

The CA/T Project responded:

The Project recognizes the need for interface management and close attention to the needs of follow-up contracts. This is the reason that access restraints and interim milestones are carefully developed and included in all contracts ... With the proper development of access restraints and interim milestones, the risk of delay claims or additional mobilization is minimized.

According to CA/T Project documents, the cost of the C01B1 contract has increased by nearly \$8 million. Of this increase, \$4.7 million or nearly 60 percent of the increase for access restraints and milestone revisions. B/PB is responsible for the "the proper development of access restraints and interim milestones." The potential for delay should have been evident and therefore been better managed by B/PB.

- b) In the August 1999 review of the C09A3 contract, the OIG reiterated from the C01B1 review, concerns about contractor access restraints. Again the CA/T Project stated that they recognized the issues and had dealt with them in "all contracts." The cost of the C09A3 contract has increased by \$8 million. Of this increase, \$4 million or 50 percent of the increase is for access delays. B/PB is responsible for "the proper development of access restraints and interim milestones" according to its management contract with the Commonwealth.

In addition to these large increases, C09A3 witnessed small increases as that might have been avoided. For example, one small increase of nearly \$10,000 dealt with meeting the requirements of state elevator inspectors. Arguably, B/PB and the designer of record should have known about changes to elevator specifications in the Massachusetts Building Code.

- c) In both a September 1998 and a November 1999 letter, the OIG expressed concerns about the increasing cost estimates for the East Boston Toll Plaza (C07C1 contract). Between 1993 and 1999 the cost estimate increased from

\$5 million to \$10 million. Responding, in part, to the OIG's concerns, the CA/T Project initiated a cost savings re-design effort for the toll plaza. As a result, the CA/T Project lowered the pre-bid construction contract cost estimate to \$7.5 million. The CA/T Project awarded the contract to the low bidder at \$7.3 million.

However, six months after construction began, the CA/T Project issued the first of a multi-part change order that would grow to more than \$2 million for design changes and revisions to the toll plaza. The MTA required most of the changes because of a need to "conform to current technological developments." **The current cost of the contract is nearly \$18 million, an increase of \$11 million or 147 percent.** In a series of letters since 1994, the OIG raised concerns about the CA/T Project continually changing designs before and during the bid process. The OIG also questioned the overall design C07C1 contract cost, which appeared to be excessive.

The OIG warned in 1998 that: "The C07C1 contract has cost more to design and will cost more to construct than necessary." B/PB should have ensured that all parties agreed to the design and that the designers of record "conformed" with technological development during the six-year design effort. B/PB chose to begin design work on the toll plaza -- arguably one of the simplest pieces of the CA/T Project to design -- six-years before the plaza's scheduled construction. B/PB should have ensured adequate toll plaza design without the incumbent redesign costs.

In addition, the toll plaza contract increased by \$4.6 million because of a scope transfer. A scope transfer is the movement of work from one contract to another. This type of transfer provides the contractor with added work that is usually paid at a rate higher than if the work had been bid. In this case, the CA/T Project added \$4.6 million in work during construction and paid a premium for this decision. B/PB's decision to transfer scope from one contract to another may have increased overall CA/T Project costs for the

Commonwealth. The decisions behind this and the many other scope transfers on the CA/T Project need to be re-examined to ensure that the transfers did not occur to make-up for management errors that may now be subject to cost recovery.

Table Two: Sample of Cost Increases Cited by the OIG

Reason	Cost Increase
Design changes during construction	\$2 million
Access restraints and milestone revisions	\$8.7 million
Renovations to state-owned building	\$6 million
Scope transfer	\$4.6 million
Construction phase services	\$3.5 million
TOTAL	\$24.8 million

Source: Chart prepared by OIG staff based on CA/T Project data.

Finding 2. Design costs increased by nearly \$3.5 million during the construction of four contracts previously reviewed by the OIG.⁷

Additional construction phase services (work performed by designers during construction) and design changes after the award of the construction contracts caused a \$3.5 million increase in design contract costs. There might have been additional design contract increases that the OIG could not identify because of the way the CA/T Project and the designers track and account for these changes. For example, the D015A design contract generated at least three construction packages (C15A1, C15A2, and C15A3). The OIG reviewed the C15A3 contract. A change to the D015A contract might not specify work related either whole or in part to the C15A3 contract. The D015A

contract had at least \$30 million in change orders for work performed by the designer during construction. Apart from the \$3.5 million directly relating to construction phase services for the C15A3 contract, it remains unclear how much of the \$30 million is related to the C15A3 contract versus the C15A1 and C15A2 contracts.

A number of the OIG's reviews warned specifically of the potential for costly design and other changes during construction. For example, the OIG stated in the April 1999 review of the C01B1 contract:

The OIG believes that significant design alteration should not be left until the bid process or beyond. Such changes are not always avoidable, but they should be the exception not common practice. Change orders for design issues that arise during construction do not benefit from a competitive process. The CA/T Project has no assurance that it has received the best price for the work.

The OIG also strongly recommended that the CA/T Project make every effort to ensure that change orders are only issued during construction for truly unforeseen conditions or circumstances such as differing site conditions. The OIG recommended that the CA/T Project use value engineering and claims avoidance reviews and that the Project consider delaying contract awards until the resolution of access restraint and contract interface issues. The CA/T Project has argued to this Office that delaying contracts would increase costs but never quantified a cost impact for the specific contracts reviewed by the OIG. This Office contends that proceeding with contracts before all issues are resolved has increased overall CA/T Project costs through access restraint and contract interface issues.

The OIG's March 2001 report, *A History of Central Artery/Tunnel Project Finance 1994-2001*, identified how B/PB intentionally assisted in the underreporting of what has amounted to billions of dollars of CA/T Project costs. Interestingly, of these billions, \$118 million⁸ pertained to design construction phase services. Arguably, B/PB's underreporting of these design costs, including the \$3.5 million identified in this report, led to

⁷ The contracts are C01B1, C07C1, C15A3, and C17A3.

⁸ See Appendix C for a copy of the budget development assumptions for design construction phase services.

the MTA paying more for these services through change orders. B/PB breached its responsibilities to create complete cost estimates and efficiently manage design and construction.

Finding 3. Change orders increased CA/T Project costs for convenience.

For construction contracts C15A3 and C18A2, the CA/T Project issued change orders with values of at least \$3 million for work to be performed at the Project headquarters at 185 Kneeland Street in Boston.⁹ The building became the primary B/PB office space for the CA/T Project in the early 1990's. In 1998, the CA/T Project merged its staff into 185 Kneeland Street from One South Station. In preparation for this move, Kneeland Street required renovation work and systems upgrading. The CA/T Project also converted the top floor (10th) of Kneeland Street into an executive floor.¹⁰ B/PB retained significant control for this move and the remaining renovations.

The Massachusetts Highway Department owned the building at that time. B/PB has since maintained the responsibility for building services and management. According to CA/T Project staff, the Project believed that issuing a change order to a construction contractor procured previously under M.G.L. c.149 (building construction) would be the most expedient course of action. B/PB managed all facets of this work. The OIG had concerns about the appropriateness and legality of these change orders. It is evident that the CA/T Project paid more for this work by using change orders than if the Project bid the work. The OIG warned the CA/T Project that awarding no-bid construction contracts violates Massachusetts' construction law and is an unsound business practice. Without competition, there is no assurance that the CA/T Project has received the best value for the contracted work.

⁹ In addition to construction, B/PB contracted with and the Commonwealth paid for space planners, attorneys, engineers, a moving company, a realtor, and a number of telecommunications contractors. According to CA/T Project documents these costs may have exceeded an additional \$3 million.

¹⁰ The executive floor had to be gutted so that new "hardwall" offices and conference rooms could be created. This floor also received an air-conditioning system upgrade.

Conclusion

For the 13 contracts previously reviewed by the OIG, costs have increased by \$125 million or 40 percent. Much of the construction cost increases is attributable to B/PB mismanagement. The OIG advised the CA/T Project that costs could increase for these contracts for a number of reasons, including design changes in the latter stages of design development, construction contractor access restraints after contract award, and insufficient planning. Since B/PB is in charge of design and construction management, the MTA should examine B/PB's responsibility for cost increases identified in the contracts discussed in this report. If B/PB is found responsible, cost recovery should be pursued.

The OIG advised that the CA/T Project needed to use more aggressive cost control measures such as value engineering and claims avoidance reviews. The OIG also suggested that the CA/T Project undertake comprehensive life-cycle costing (LCC)¹¹ for the structures under review. A LCC would have enabled the CA/T Project to plan for future operations, maintenance costs, and may have helped identify costly design elements.

In most cases, the CA/T Project following B/PB's expert advice did not agree with the OIG's recommendations. This report illustrates how, in some cases, OIG analyses proved accurate. Costs may have increased to some degree even if the CA/T Project had accepted the OIG's recommendations. However, taking certain prudent steps might have mitigated some of the larger construction cost increases. For example, the OIG opines that the \$8.7 million in access delay related cost increases equate to "cost minimization" as expounded by the CA/T Project. Since B/PB mismanaged these contracts which ultimately forced to pay a higher cost for the CA/T Project, B/PB should be held responsible.

¹¹ Life-cycle costing is conducted to identify all costs for acquisition, construction, operations, and maintenance of a facility during its expected useful life.

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Appendix A:

Cost recovery related reports:

- 1) *Proposal to Pursue Big Dig Cost Recovery: Ceiling Installation in the Ted Williams Tunnel.* October 2003.
- 2) *A Recommendation for Cost Recovery Against the Big Dig's Management Consultant: Grout Heave-Related Contractor Claims on the C11A1 Contract.* February 2003.
- 3) *A History of Central Artery/Tunnel Project Finances 1994-2001: Report to the Treasurer of the Commonwealth.* March 2001.
- 4) *A Review of the Central Artery/Tunnel Project Cost Recovery Program.* December 2000.
- 5) *Statutorily Mandated Reviews of Central Artery/Tunnel Project Building Construction Contracts 1997-1999.* December 1999.
- 6) *A Review of the Central Artery/Tunnel Project's use of Anchor Bolts on the C05B1 Tunnel Finishes Contract.* December 1998.
- 7) *Statutorily Mandated Reviews of Central Artery/Tunnel Project Building Construction Contracts 1994 - 1996.* December 1996.

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Appendix B:

Contract Descriptions

1. C24A2 - Phase One Central Maintenance Facility - located on D Street in South Boston. Maintenance and storage facility for MassHighway and/or Turnpike Authority staff and vehicles responsible for operating and maintaining the roadways that are part of the Metropolitan Highway System (MHS).
2. C24F1 - Technical Services Relocation - located on D Street in South Boston. Relocation of MassHighway staff from part of the site to accommodate the needs of the C24A2 contract and relocation of CA/T Project staff from another relocation. Includes renovation of building on D Street site to accommodate staff and equipment for both MassHighway and CA/T Project materials testing laboratory staff.
3. C07A5 - East Boston Electrical Substation/Emergency Response Station - located at Logan Airport in East Boston near the mouth of the Ted Williams Tunnel. Substation needed for the energy needs CA/T Project systems (such as ventilation and lighting) and the response station houses emergency vehicles for use in the Tunnel and the East Boston section of the MHS.
4. C15A3 - Ventilation (Vent) Building No. 4 - located at parcel seven at Haymarket in Boston. The contract includes in addition to a vent building, a parking garage, office/commercial space, and renovation to the Massachusetts Bay Transportation Authority's (MBTA) Haymarket Station of the Orange Line.
5. C24A1 - Operations Control Center Complex - located in South Boston at the mouth of the Ted Williams Tunnel. This contract started before the OIG's mandate. However, when the CA/T Project issued a change order for the construction of a temporary police/emergency response station, the OIG opined that a review of the change order was necessary.
6. C07A1 - I-90 Bird Island Flats Tunnel - located in East Boston, this contract was for the construction of the roadways connecting the Ted Williams Tunnel with the Logan Airport interchange. The CA/T Project issued a change order for this contract for the construction of a temporary toll plaza in East Boston. The OIG opined that a review of the change order was necessary.
7. C17A3 - Vent Building No. 3 - located in downtown Boston on Atlantic Avenue alongside Russia Wharf.

8. C01B1 - Vent Building No. 5 - located in South Boston between the mouth of the Ted Williams Tunnel and Fort Point Channel.
9. C09A3 - Vent Building No. 1 - located in downtown Boston behind South Station alongside Fort Point Channel.
10. C19E4 - Vent Building No. 8 - located in downtown Boston alongside the Fleet Center.
11. C07C1 - East Boston Toll Facility - located in East Boston near the mouth of the Ted Williams Tunnel. This facility replaced the temporary facility constructed under C07A1.
12. C18A2 - Dewey Square Air Intake Structure - a ventilation structure located at Dewey Square in downtown Boston near South Station.
13. C19B9 - Ancillary Facilities North of Gilmore Bridge - located in Charlestown, this contract consists of a one-story maintenance and emergency response station, a salt shed and fuel island, an electrical substation and renovations to the MBTA's Bunker Hill Community College Station of the Orange Line.

Appendix C:

Project overrun cost analysis prepared by B/PB in December 1999 may be found in Appendix Three of the March 2001 OIG report entitled, *A History of Central Artery/Tunnel Project Building Construction Contracts 1997-1999*.

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The following table summarizes key budget development assumptions.

Category	Key Issues	CSU Rev 6 Budget (12/94)	Project Experience as of 12/94	Current Forecast	Current Forecast less CSU Rev 6 Budget (\$)
Final Variance	Construction Growth during Final Design	0%	18%	13%	437 M
Final Variance	Markplace Completion	-13%	-13%	-9%	280 M
PCA	% Change from Original Contract Value	10.7% Overall 7% to go	25%	17.9%	510 M
Schedule	Schedule Acceleration	-11%	Not quantified	2.2%	200 M
Management Commitment from 2002	At Rev 5 level through 2002	1,402 M	1,036 M *	1,749 M	267 M
Management Commitment beyond 2002	At Rev 5 level 2002 - 2004	-11%	128 M *	100 M	100 M
Design Construction Phase Services	% of Construction Costs	1.26% - 99 M	2.15% - 195 M	217	118 M
Final Design Costs	No Contingency	688 M	Not quantified	721 M	32 M
FDIV	In Excess of Fin Taint	-0 -	Not quantified	175	175 M
Total					2,119 M

* Joint Venture '94 Staffing Assessment

